## REMARKS

The Examiner is thanked for the careful review of the application as set forth in the outstanding office action. Reconsideration of the application in view of the foregoing amendments and the following discussion is respectfully requested.

Objection under Section 112, First Paragraph

Claims 6-9, 12, 16, 22 and 29-30 stand rejected as failing to comply with the enablement requirement. The Examiner asserts that the specification does not provide an adequate written description of the limitations as recited in claims 6-9, 12, 16, 22 and 29-30, "moving the printing element in a direction transverse to the swath axis." This rejection is respectfully traversed on the ground that a prima facie case for lack of enablement has not been established, and the specification fully supports the claim limitations pointed out by the Examiner.

The Examiner has not pointed out how the specification fails to support this claim limitation, and so the rejection is not fully understood. The specification clearly supports moving the printing element in a direction transverse to the swath axis. This is discussed, by way of example only, at 5:5-11, 6:11-26; 8:12-19; 9:18-23; 11:1 to 13:17, and exemplary embodiments of systems for providing movement in a direction transverse to the swath axis are shown in FIGS. 12-17.

Withdrawal of the rejection is respectfully requested.

Claims Rejections - 35 USC 102

Claims 1-22 and 24-30 stand rejected as being anticipated by DeLacy. This rejection is respectfully traversed for the reasons discussed below.

Claim 1:

Claim 1 is drawn to a method for high accuracy media positioning in a swath printer, comprising:

[A] mounting a computer-controlled printing element for movement along a swath axis for swath printing of an image on a print medium;

[B] moving the printing element along the swath axis and printing at least a portion of a swath of the image on the print medium;

[C] activating a media advance mechanism to provide a nominal advance movement between the printing element and the print medium to position for a fresh swath;

[D] moving the printing element along the swath axis;

[E] sensing the position of an edge of a just printed portion of said image which is nominally aligned with the scan axis, wherein said edge is a bottom edge of a previously printed swath in relation to a direction of print medium advance through the swath printer past the printing element;

[F] providing relative motion between the print medium and the printing element to accurately position the printing element in dependence on the sensed position of the edge of the just printed portion of the image to align the top edge of the next swath to be printed in relation to the bottom edge of the previously printed swath.

In the above recitation of the claim, the reference letters A-F have been added for convenience in reference.

The applicant does not agree with the Examiner's recitation of the teachings of DeLacy. Exemplary examples will be discussed below.

DeLacy does not describe a method as recited in Claim 1. DeLacy describes a technique for positioning the paper for a swath by moving the carriage to a position at which a demarcation exists, e.g. printed by a print element, and performing a closed loop servo positioning of the paper with the carriage at this position, by sensing the position of a top edge of a demarcation as the paper is moved along the paper advance direction and using the sensed position in a servo loop. The advance is by a fixed amount, i.e. by a desired stepping increment (11:36-37), which is selected to be the width of each line or swath. Deviations from this desired stepping increment are not detected or compensated.

DeLacy does not disclose at least limitations E and F of Claim 1. DeLacy does not align the top edge of the next swath to be printed in relation to the bottom edge of the previously printed swath.

The rejection of Claim 1 as well as all claims depending therefrom should be withdrawn because a prima facie case of anticipation has not been established, and DeLacy does not describe each limitation of these claims. Exemplary ones of the dependent claims are discussed further below.

Claim 2:

Claim 2 recites that the step of providing relative motion is carried out on the fly as the portion of the image is being printed and the print element is moving in the scan axis. The Examiner alleges that DeLacy describes these limitations, i.e. "wherein said step of providing relative motion is carried out on the fly (paper position error, col. 11, lines 63-68 and col. 12, lines 1-20) as the portion of the image is being printed and the print element is moving in the scan axis." A new Claim 31 has been added, which is drawn to the features of Claim 2 as originally presented. DeLacy does not describe the limitations. The passages cited by the Examiner describe moving the print head to print a dot as the demarcation, and subsequently returning the print head and sensor to a recorded position corresponding to a suitable demarcation from which the paper can be servoed. The carriage and sensor are held in this stationary position while the paper is servoed (11:34-35). There is no description that the paper positioning takes place while a portion of the image is being printed and the print element or head is moving in the scan direction.

Similar considerations apply to Claim 2 which depends from amended Claim 1.

Claim 4:

Claim 4 recites that the step of providing relative motion between the print medium and the printing element is performed simultaneously with the step of moving the printing element along the swath axis to print at least a portion of the

fresh swath. As discussed above regarding Claim 30 and Claim 2, DeLacy does not describe this feature. The Examiner asserts that the limitations of Claim 4 are described in the Abstract and at col. 14, lines 27-34. Applicant denies that DeLacy provides this description. The Abstract does not describe the features added by Claim 4. DeLacy at 14: 27-34 (Claim 7) recites that "said fine positioning means is responsive to the output of said means for detecting said demarcations to bidirectionally position said paper relative to said print head." The fine positioning means is not described. However, there is no description that the positioning is performed "simultaneously with moving the printing element along the swath axis to print at least a portion of the fresh swath."

Claim 6:

Claim 6 has been amended for the sole purpose of placing the claim in independent form, and does not include amendments herein made to Claim 1. Claim 6 recites "providing relative motion between the print medium and the printing element to accurately position the printing element in dependence on the sensed position of the edge of the just printed portion of the image, said providing relative motion comprising moving the printing element in a direction transverse to the swath axis." The Examiner asserts that DeLacy describes this feature, "moving the printing element (paper; col. 3, line 68) in a direction transverse to the swath axis (this invention is to provide a paper transport system capable of very accurate paper position relative to a print head capable of printing lines orthogonal to a direction of paper advance. Col. 3, lines 65-68." This does not meet the claim limitations. The "paper" cannot be read on the "printing element." The discussion of a paper transport system for paper position relative to a print head capable of printing lines orthogonal to a direction of paper advance does not meet the limitation of moving the printing element in a direction transverse to the swath axis.

Claims 7-9:

These claims depend from Claim 6, and further define the feature of moving the printing element in a direction transverse to the swath axis. It is unclear from the office action how the Examiner seeks to read DeLacy on the limitations of Claims 7-9. Regarding Claim 7, the Examiner appears to read the print head 12 or the drive belt 24 on the actuating element of Claim 7, and states that it is inherently known in the art that an actuator is included for driving the print head. These allegations do not meet the limitations of Claim 7, since neither the print head, the drive belt or any actuator for driving the print head is described for moving the printing element (print head 12 of DeLacy) in a direction transverse to the swath axis. Moreover, there is no description of positioning an actuating element as recited in Claim 7 between the printing element and the carriage.

Claim 8 recites "positioning an actuating element between the slider rod and the carriage. The Examiner asserts that DeLacy describes positioning an actuator element between the slider rod and the carriage, generally referring to FIG. 3, but does not point to any actuator element shown in this figure. Claim 9 recites positioning an actuating element between the slider rod and a corresponding slider support structure. The Examiner alleges that DeLacy describes "positioning an actuator element between the slider rod and corresponding slider support structure (drive motor shaft, Fig. 3, ref # 28)" and "driving the actuating element to move the slider rod and with it the carriage and the printing element to obtain the accurate positioning (Fig. 3, col. 14, lines 1-4)". These elements do not meet the claim limitations. The drive motor shaft 28 is not positioned between the slider rod and slider rod support structure. In fact, no such support structure is shown in FIG. 3. Nor does the motor shaft serve as an actuator to move the slider rod. As for col. 14, lines 1-4 of DeLacy, this claim recites elements of the drive means for intermittently advancing the paper relative to the print head.

Claim 12:

Claim 12 has been amended for the sole purpose of placing the claim in independent form. This claim recites a method including:

mounting an actuating element between each said printing element and said carriage; and

actuating each of said actuating elements to move the respective printing elements in a direction transverse to the swath axis.

DeLacy does not disclose the method of this claim. The Examiner appears to read the actuating element as recited in this claim on the print head or on the drive belt. However, there is no description of an actuating element to move the respective printing elements in a direction transverse to the swath axis. Instead the drive belt moves the print head along the swath.

Claim 13:

Claim 13 is drawn to a swath printer, comprising:

[A] a computer-controlled printing structure;

[B] a carriage for holding the printing structure, said carriage mounted for movement along a swath axis at a print area for swath printing of an image on a print medium;

[C] a carriage drive system for driving the carriage along the swath axis;

[D] an optical sensor system mounted to the carriage for sensing the position of a bottom edge of a just printed portion of said image which is nominally aligned with the scan axis;

[E] a media advance system for moving the print media along a media path and past the print area;

[F] a fine positioning system for providing incremental relative motion between the print medium and the printing element to accurately position the printing element to align the top edge of a to-be-printed image portion in relation to the bottom edge of the just printed portion in

dependence on the sensed position of the bottom edge of the just printed portion of the image.

The reference characters have been added for ease of reference.

DeLacy does not disclose a printer as recited in Claim 13.The advance is by a fixed amount, i.e. by a desired stepping increment (11:36-37), which is selected to be the width of each line or swath. Deviations from this desired stepping increment are not detected or compensated. DeLacy does not disclose at least limitations D and F of Claim 13. DeLacy does not provide a fine positioning system as in Claim 13 to align the top edge of the to-be-printed image portion to be printed in relation to the bottom edge of the just printed portion.

The rejection of Claim 13 as well as all claims depending therefrom should be withdrawn because a prima facie case of anticipation has not been established, and DeLacy does not describe each limitation of these claims. Exemplary ones of the dependent claims are discussed further below.

Claim 15.

Claim 15 further recites that the fine positioning system is actuated to provide relative motion to accurately position the printing element in relation to the print medium simultaneously as the printing structure is moved along the swath axis. The Examiner states that DeLacy discloses a swath printer, "wherein said fine positioning system is actuated to provide relative motion to accurately position the printing element in relation to the print medium simultaneously (Abstract and col. 14, lines 27-34) as the printing structure is moved along the swath axis." Applicant respectfully disagrees that the reference describes these limitations. The passages cited by the Examiner simply do not support the alleged teachings. DeLacy describes that the carriage and sensor are held in a stationary position while the paper is servoed into position (11:34-35). There is no description that the positioning system is actuated to provide relative motion to accurately position the printing element in relation to the print medium simultaneously as the printing structure is moved along the swath axis.

Claims 17-19 and 22:

The limitations of these dependent claims are not described in DeLacy, for reasons similar to those discussed above regarding Claims 7-9 and 12.

Claim 24:

Claim 24 recites that the sensor system includes a first sensor mounted on a first side of the carriage and a second sensor mounted on a side of the carriage opposite the first side along the swath axis, the sensor system adapted for bidirectional sensing operation. DeLacy does not disclose a sensor system as recited in Claim 24. The Examiner asserts that DeLacy does disclose a first sensor 31 mounted on a first side of the carriage and a second sensor 33 mounted on a side of the carriage opposite the first side along the swath axis. Applicant disagrees. Elements 31 is an emitter for the detector 33, and thus the pair appear to constitute a sensor. Moreover, neither is mounted on the carriage. Claim 24 is not disclosed by DeLacy.

Claim 25:

Claim 25 is drawn to a method for swath printing, comprising:

[A] printing a first swath of an image on a print medium with an ink-jet printing structure;

[B] advancing the print medium to position the medium for printing a second swath;

[C] determining zones of the second swath which need high accuracy swath alignment;

[D] begin printing the second swath;

[E] during said printing of the second swath, for those zones which need high accuracy swath alignment, determine the alignment errors and store in memory appropriate error compensation values;

[F] after completing the printing of said second swath, calculate the next media advance distance based on the stored compensation values; and

[G] advancing the media for the next swath to be completed by a distance dependent on said next media advance distance.

The reference characters have been added for ease of reference.

DeLacy does not disclose at least limitations C, E, F and G. The passages cited by the Examiner do not meet the claim limitations. While the controller includes RAM, there is no discussion that error compensation values are stored in memory, or that the next media advance distance is based on stored compensation values.

Claim 26.

Claim 26 is drawn to a method for high accuracy media positioning in a swath printer, comprising:

[A] providing a print medium;

[B] providing a computer-controlled printing element, the printing element mounted for along a swath axis to print a first swath on the print medium;

[C] moving the printing element along the swath axis and printing at least a portion of a swath on the print medium, said swath having a leading edge and a trailing edge;

[D] providing relative motion between the printing element and the print medium to position for a fresh swath;

[E] sensing the position of the trailing edge of the just printed swath;

[F] providing relative motion between the print medium and the printing element to accurately position for the fresh swath in dependence on the sensed position of the trailing edge of the just printed swath to compensate for position errors between a nominal position of the trailing edge and the sensed position of the trailing edge of the just printed swath; and

[G] moving the printing element along the swath axis to print at least a portion of the fresh swath.

The reference characters have been added for ease of reference.

DeLacy does not disclose at least limitations E, F. The passages cited by the Examiner do not meet the claim limitations.

Claim 27:

This claim depends from Claim 26 and further recites that said step of sensing the position of the trailing edge and said step of providing relative motion between the print medium and the printing element is performed simultaneously with the step of moving the printing element along the swath axis to print at least a portion of the fresh swath. DeLacy does not disclose the limitations of this claim, for reasons similar to those discussed above regarding Claim 2.

For these reasons, a prima facie case of anticipation has not been established, and DeLacy does not describe each element of Claims 1-22 and 24-30. The rejection under Section 102 should be withdrawn.

Claims Rejections - 35 USC 103

Claims 23 and 30 stand rejected as being unpatentable over DeLacy in view of Wen et al. ("Wen"). This rejection is respectfully traversed on the grounds that a prima facie case of obviousness has not been established.

Claim 23 depends from Claim 13, and further recites that the fine positioning system includes a piezoelectric actuator for providing the incremental relative motion.

Claim 30 depends from Claim 26, and further recites that said moving the printing element in a direction transverse to the swath axis includes:

positioning a piezoelectric element between the printing element and the carriage; and

driving the piezoelectric element to move the printing element to obtain the accurate positioning.

The Examiner alleges that Wen discloses a fine positioning system which includes a piezoelectric actuator (col. 6, lines 41-44) for providing the incremental relative motion, regarding Claim 23, and that Wen discloses positioning a

piezoelectric element between the printing element and the carriage, and driving the piezoelectric element to move the printing element to obtain the accurate position. Applicant respectfully disagrees that Wen provides the alleged teaching. In fact, Wen describes that the ink drop ejection can be accomplished by piezoelectric actuators or thermal electric actuators, i.e. that the printing element can be a piezoelectric type, but does not describe a piezoelectric actuator for moving a printing element as recited in these claims. The rejection should be withdrawn.

## CONCLUSION

The outstanding rejections have been addressed, and the application is in condition for allowance. Such favorable reconsideration is solicited.

Respectfully submitted,

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Larry K. Roberts
Registration No. 28,464

Law Offices of Larry K. Roberts, Inc.
P.O. Box 8569
Newport Beach, CA 92658-8569
Telephone (949) 640-6200
Facsimile (949) 640-1206